

U.S. NAVY F-35C AIRSHOW PROFILE MANEUVER DESCRIPTIONS

1. F-35C Fleet Replacement Squadron Tactical Aircraft Airshow Flight Profile (FRS AFP) Maneuver Descriptions.

a. General Guidance

(1) The F-35C FRS AFP consists of eight maneuvers by a single aircraft. While no additional maneuvers are authorized, any maneuver may be deleted at the discretion of the pilot or safety observer.

(2) All maneuvers, except takeoffs and landings, are performed outside a show line established parallel to 500 feet (non-aerobatic passes) or 1,500 feet Clear Air Turbulence CAT) I aerobatic passes, laterally from the crowd. Lateral offset differs from maneuver to maneuver, X-wind corrected, in order to be in compliance with FAA restrictions and are outlined in the individual maneuver descriptions. Takeoffs and landings are performed no closer than 500 feet laterally from spectators. Minimum runway length is 7,000 feet Takeoff Distance Available (TODA). Show sites with shorter runways must be approved by the Commodore. Maximum distance that the aircraft will ever be from the center point of the show line is 3.5nm. Pilots may elect to utilize less than the full runway available for show center considerations, but "V_{ROT}" (V-Rotate) should not be greater than "Max Abort" without prior approval from FRS CO.

b. Standard Terminology

(1) The standard termination of each pass is a high performance turn and climb with the option for a 270 degrees "Thunderbird" roll as the pilot positions the aircraft for the next pass.

(2) Throughout this document, when the term MAX AB is seen, pilots should interpret that to mean select 150 percent Engine Thrust Request (ETR) and confirm good afterburner light-off.

(3) Lift Limit Pulls are defined as stick full aft to the Complementary Low Altitude Warning (CLAW) limit below corner airspeed (34 Alpha).

(4) Lift Limit Excursion Pulls are defined as stick full aft to the CLAW limit below corner airspeed with pinky switch (S10) depressed (50 Alpha).

(5) Load limit pulls are defined as stick full aft to the CLAW limit above corner airspeed.

(6) The "waterline" is defined as where the nose of the aircraft is pointing and will be referenced in maneuver descriptions vice Flight Path Marker and Climb Dive Marker.

(7) The abbreviation "A/R" for a parameter means "as required" and "N/A" means "not applicable."

(8) A "staged show" is defined as an aerobatic box that is not geographically collocated with the airfield from which the jet is parked such as an over water show.

c. The maneuver should be terminated for any WARNING, latched CAUTION Integrated Caution Advisory Warning (ICAW) or recognition of AB blowout and failure to light.

(1) Termination Nose High (NH) requires immediate NH recovery procedures, while Nose Low (NL) requires immediate NL recovery procedures utilizing:

(a) MAX AB below 250 KCAS.

(b) Throttle Idle above 250 KCAS. If at any time recovery audio is present, accomplish Out-of-Control Flight recovery.

d. Ground Collision Avoidance System (GCAS) will be set to STBY.

e. Pilots should walk only with Flight Check List (FCL) and kneeboard.

f. Portable Mobile Device (PMD) will be utilized to record in-flight execution.

2. Configuration. 3F (TVE-18 or GREATER) aircraft are required. The profile is flown in a standard configuration with AME-3 only. Internal unloaded BRU or LAU configurations are permitted. External fuel-tanks and stores and wing pylons are prohibited. Recommended start-up fuel:

a. Staged AFP: 13,000 pounds.

b. AFP + Legacy: 12,000 pounds.

c. AFP: 10,000 pounds.

3. Weather Minimums

a. AFP: 1,500 feet ceiling and 5 SM visibility.

b. 360° defined horizon.

4. Altitude Restrictions

a. Maximum Altitude: 15,000 feet AGL unless otherwise restricted by FAA airshow constraints.

b. Minimum Altitude: 200 feet AGL (except takeoff and landing).

5. Additional Takeoff Checklist Items. The items listed in subparagraphs 5a through 5o should be checked after completion of the post-start and takeoff checklist in the conduct of flight demonstrations.

- a. NAV Master Mode
- b. Altimeter. Set (0 feet).
- c. Flight Instruments/NAV AIDS. Set HIS – 10nm.
- d. JOKER/BINGO/DUMPCO – Set:
 - (1) JOKER – A/R.
 - (2) BINGO – A/R.
 - (3) DUMPCO – A/R.
- e. Altitude Bugs
 - (1) LIS – 5000.
 - (2) ALOW1 – 2500.
 - (3) ALOW2 – 180.
- f. HMD – box TIME.
- g. RUD PED – Adjusted.
- h. Lap Belts – TIGHT.
- i. G-suit – Zipped / Tested.
- j. PCL – STOWED.
- k. Mapcase – LOCKED.
- l. BUR – T/R.
- m. RECORDERS – Boxed.
- n. GCAS – STBY.
- o. External lighting master switch – OFF.

6. Maneuver Profiles

a. Takeoff to MAX V_x CLIMB

(1) Execution: Hold brakes while selecting MIL. As ENGINE THRUST (ACTUAL) increases through 35 percent release brakes. Select MAX AB and check engine conditions on the roll. Smoothly rotate at V_{ROT} speed and select LG UP once weight off wheels. Continue to smoothly increase aft stick while the LG is in transition targeting 1.5 Gz. Confirm gear is retracted and the light is extinguished in the gear handle. Keeping MAX AB selected, continue 1.5 Gz to 60 degrees NH. At 100 KCAS, unload the waterline towards the horizon. Passing 4,000 feet AGL execute a slightly overbanking turn to descend for the next maneuver setup.

(2) Abnormal Procedures: If AB blows out or WARNING/CAUTION latches during the pull to 60 degree NH, abort the maneuver. If the AB blows out or WARNING/CAUTION latches during the climb, or the jet decelerates below 100 KCAS, abort the maneuver and execute a nose high recovery if appropriate.

b. Takeoff to MAX V_y CLIMB

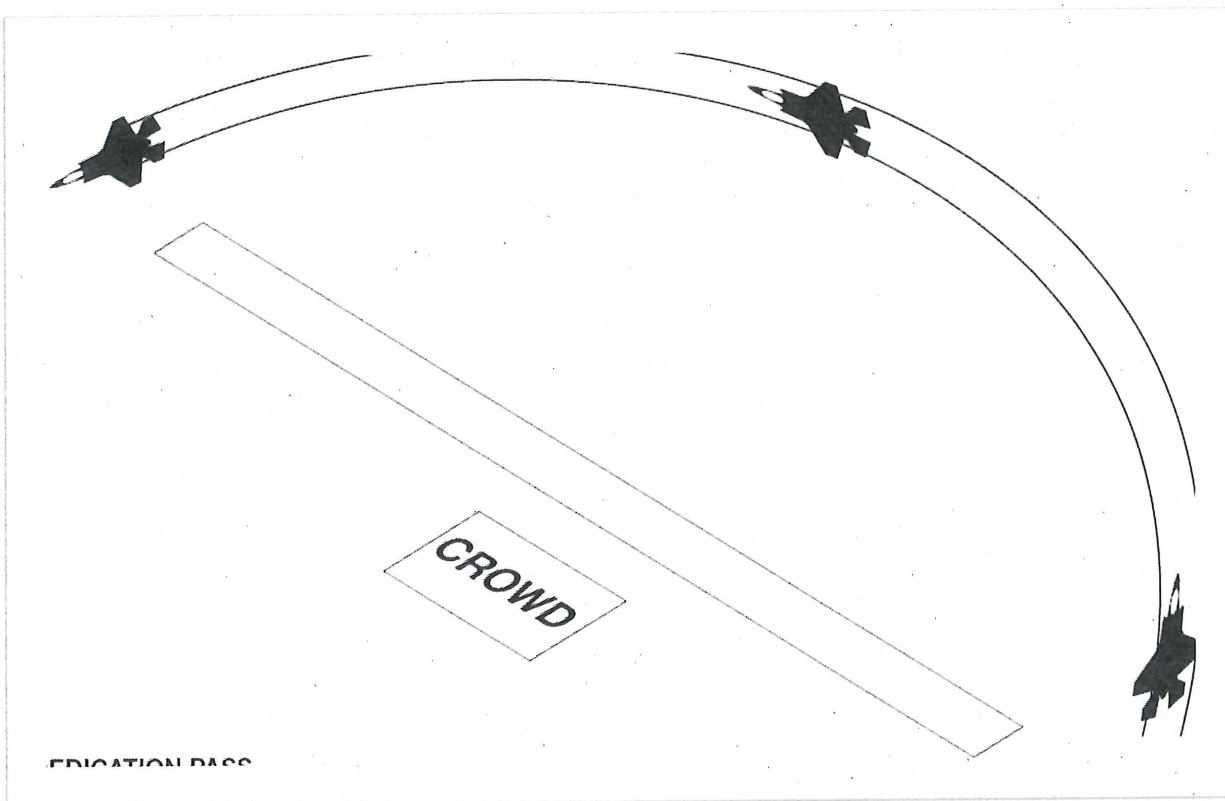
(1) Execution: Hold brakes while selecting MIL. As ENGINE THRUST (ACTUAL) increases through 35 percent release brakes. Select MAX AB and check engine conditions on the roll. Smoothly rotate at V_{ROT} speed and select "LG UP" once weight off wheels. Confirm gear is retracted and the light is extinguished in the gear handle. Accelerate in MAX AB with a positive rate of climb until passing show center on runway heading. At 325 KCAS execute a Lift Limit Pull to 60 degrees NH. Hold 60 degrees NH until passing 4,000 feet AGL then execute a 2-3G slightly overbanking turn to descend and slow for the next maneuver setup.

(2) Abnormal Procedures: If AB blows out or "WARNING" or "CAUTION" latches during accel or the pull to 60 degrees NH, abort the maneuver. If the AB blows out or "WARNING" or "CAUTION" latches during the climb, or the jet decelerates below 100 KCAS, abort the maneuver and execute a NH recovery if appropriate.

c. Dedication and Picture Pass

(1) Execution: This maneuver is flown beyond the 500-foot show line. The approach will be flown from behind the line, approximately two miles from show center with an approximate dive angle of 30 degrees and a maximum of 45-degree cut from the show line (as to not exceed 75 degrees of bank in turn). Maintain beyond 500 feet horizontally from the crowd at all times. Upon reaching a point 500 feet from the corner of the crowd at 300 feet AGL, roll the aircraft into a level 4G arcing pass using 75 degrees of bank. Select MAX AB until past the show line or until 400 KCAS is anticipated. In order to maintain 500 feet separation from the crowd at both corners, the apex of the arc will be greater than 500 feet from show center.

(2) Abnormal Procedures: Discontinue AB if 450 KCAS is reached.



Target Parameters				
Altitude AGL		Mach/KCAS	Power Setting	Pull
Entry	300 feet	400	MAX	A/R
Exit	300 feet	400	MAX	A/R
Parameter Limits				
Altitude AGL		Airspeed / Mach MIN/MAX	Power Setting	Pull
Entry	Min 200 feet	350 / 450	A/R	Load Limit
Exit	Min 200 feet	350 / 450	A/R	Load Limit

d. High Speed Pass

(1) Execution: This maneuver is flown beyond the 500-foot show line. The approach will be flown wings level with an approximate dive angle of 30 degrees. Maintain beyond 500 feet horizontally from the crowd at all times. Upon reaching a point 500 feet from

the corner of the crowd at 300 feet AGL select MAX AB until past the show line or until .94M is anticipated. Execute a Load Limit Pull to 60 degree NH. Hold 60 degree NH until passing 4,000 feet AGL then execute a 2-3G slightly overbanking turn to descend and slow for the next maneuver setup.

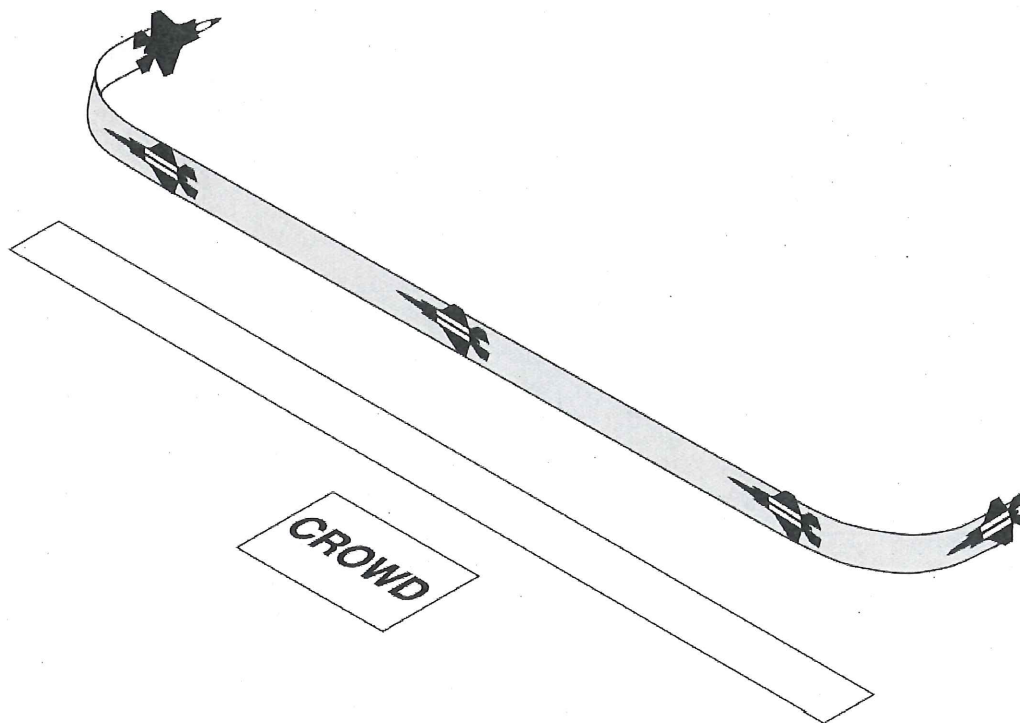
(2) Abnormal Procedures: Discontinue AB if .95M is reached.

Target Parameters					
Altitude AGL			Mach	Power Setting	Pull
Entry	300 feet		0.65-0.94	MAX	A/R
Exit	300 feet		0.65-0.94	MAX	A/R
Parameter Limits					
Altitude AGL			Airspeed / Mach MIN/MAX	Power Setting	Pull
Entry	Min	200 feet	0.5 / 0.95	A/R	Load Limit
Exit	Min	200 feet	0.5 / 0.95	A/R	Load Limit

e. Weapon Bay Doors (WBD) Pass

(1) Execution: Enter at a 30-45 degree angle off in front of the crowd line and set and maintain 350 KCAS and 300 feet AGL. While wings level and approaching the 1,500 feet show line, open the WBD, then bank away from the crowd to maintain airspeed, altitude and apex no closer than the 500 feet show line. Once past show center select MAX AB, close the WBD and pull for next maneuver setup.

(2) Abnormal Procedures: Abort the pass if the doors don't open normally and symmetrically.



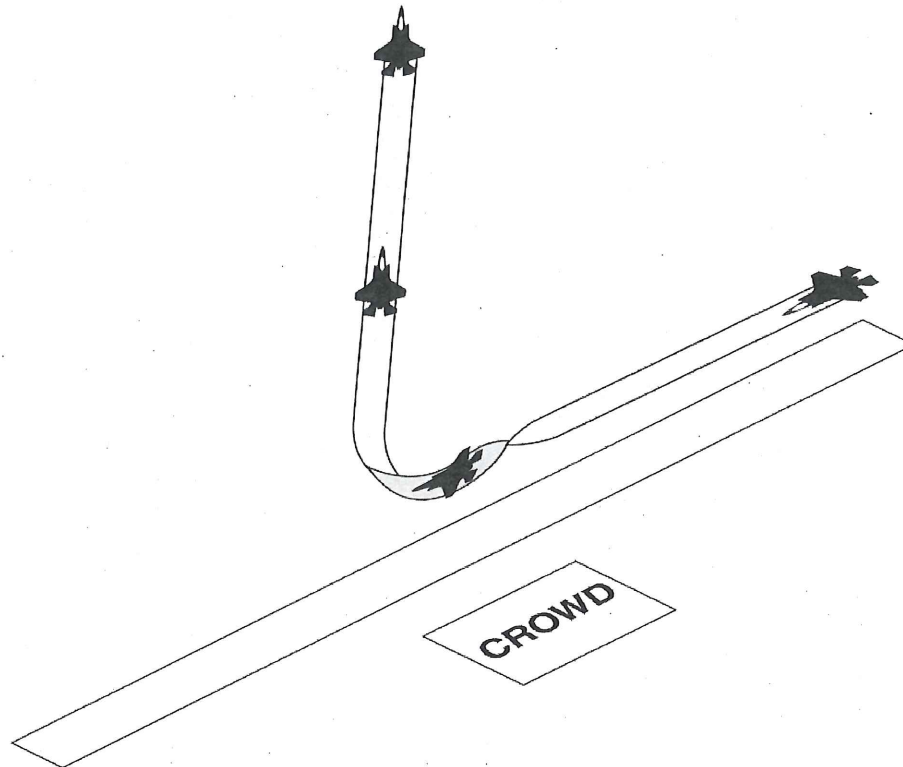
WEAPONS BAY DOORS PASS

Weapon Bay Doors Pass Target Parameters			
Altitude AGL	Airspeed KCAS	Power Setting	Bank
Entry 300 feet	350	A/R	75
Exit 300 feet	350	A/R	75
Parameter Limits			
Altitude AGL	Airspeed KCAS MIN/MAX	Power Setting	Bank
Entry : Minimum 200 feet	200 / 400	A/R	90
Exit: Minimum 200 feet	200 / 400	A/R	90

f. TAC Pitch

(1) Execution: Enter on the 500 feet show line, 300 feet AGL, and 200 KCAS. Select MAX AB and at 250 KCAS set 60 degree of bank, and perform a Lift Limit Excursion for 120-135 degree of turn. At 150 KCAS roll out using full lateral stick and rudder and then smoothly neutralize to set approximately 50-60 degree of pitch on the waterline demonstrating the jet's ability to climb out after an aggressive change in nose position. Terminate the maneuver with a NH recovery.

(2) Abnormal Procedures: If the AB blows out or airspeed decays below 125 KCAS, abort the maneuver by rolling wings level and commanding full forward stick (A/R) until less than 30 degrees of pitch and then accelerate away from the show line.



TACTICAL PITCH

Target Parameters			
Altitude AGL	Airspeed KCAS	Power Setting	Pull
Entry 300 feet	250	MAX	LIFT LIMIT (S10)
NH RCVY	150	MAX	A/R
Parameter Limits			
Altitude AGL	Airspeed KCAS MIN/MAX	Power Setting	Pull
Entry Min 200 feet	230 / N/A	MAX	N/A
NH RCVY Min	125 / N/A	MAX	N/A

g. Min Radius Turn

(1) Execution: Enter on the 500 feet show line at 300 feet AGL and 380KCAS. Select MAX AB and pull to maintain 400-425 KCAS through the first 180 degree of turn with a 1.5 degree NH FPM to make the turn appear level. Tighten turn for second 180 degree to end on the 1,500 feet show line utilizing a 1.5 degree NL FPM. Approaching show center, unload and roll back to wings level. Execute a Lift Limit Pull to 60 degree NH. Hold 60 degree NH until passing 4,000 feet AGL then execute a 2-3G slightly overbanking turn to descend and slow for the next maneuver setup.

(2) Abnormal Procedures: Abort the maneuver if the AB blows out at any time. Throttle modulate if the aircraft accelerates at 7.5 Gs. If the aircraft descends below 400 feet AGL during the minimum radius turn or the airspeed decays below 250 KCAS, abort the maneuver by climbing and clearing the show line with a MAX AB, Lift Limit Pull.

Target Parameters			
Altitude AGL	Airspeed KCAS	Power Setting	Pull
Entry 300 feet	410	MAX	Load Limit
Exit 300 feet	410	MAX	Load Limit
Parameter Limits			
Altitude AGL	Airspeed KCAS MIN/MAX	Power Setting	Pull
Entry Min: 200 feet	400 / 425	A/R	Load Limit
Exit Min: 200 feet	350 / 425	MAX	Load Limit


h. Carrier Break to Field Landing Carrier Practice Landing. Execution: Align the aircraft to the runway. At 500 feet AGL, 320 KCAS over the numbers select MAX AB. At 350 KCAS initiate a MAX AB break for 90 degree of turn then execute a normal decelerating break turn to arrive at the 180 degree with throttles at idle below 300 KCAS. Use full lateral stick to ensure crisp rolls into and out of angle of bank. Once established on downwind, perform landing checklist and closely monitor G while gear is in transition. Execute a normal Delta Flight Path (DFP) on-speed touch and go just prior to show center.

i. Hook Down Pass. Execution: 250 knots Picture Pass with Hook Extended: Enter at a 10 degree angle off slightly behind the crowd line and set and maintain 250 knots and 300 feet AGL. Hook down below 275 knots and geometry set. 15 degree bank angle towards show center, reversing NCT the 500 feet line. Hook up post crowd line and accelerate for the next maneuver. Do not exceed 300 knots or 1.5G until the hook light is out.

j. Four Point Roll. Execution: Setup at 1,500 feet showline targeting 300 feet AGL and 350 knots. Approaching the showline, initiate a pull to set seven degrees nose high with the climb dive marker. Upon reaching seven degrees NH, initiate a smooth roll towards the crowd for 90 degrees bank angle degree (knife edge). Slight top rudder may be used to maintain aircraft attitude. Hold the knife edge position for one second, then continue roll in the same direction until inverted. Once inverted, execute a slight unload to maintain aircraft attitude with positive flight path angle and VSI and maintain for one second. Continue roll to knife edge away from the crowd and expect a slight nose low position while holding for one second. Lastly, roll the aircraft upright and execute reposition maneuver.

7. Reposition Maneuvers. Reposition maneuvers may be flown in either direction at any time during the flight sequence as required. Per FAA regulations, 90 degree of bank may be exceeded during repositions (if required). The standard repositioning maneuver is of a climbing check turn away from the show line, a 270 degree "Thunderbird" roll away from the crowd (i.e., roll left to turn right), and then a descending turn back toward the show line while setting up for the next maneuver.

8. Contingencies. If there is a remote launch site or a weather minimum check is required, the show will be commenced at show center. The sequence should then continue as appropriate for site constraints or weather. For a remote site with no runway or an overwater show, the show sequence will not include the Carrier Break to T and G with the final maneuver being the High Speed Pass.



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